FIG. 1

2D FOURIER SLICE THEOREM

FIG. 2

$F[P(\theta,\phi,\varphi,r,t)]$ = 2d Fourier transform
of $P(\theta,\phi,\varphi,r,t)$

$f(x,y,z)$

$P(\theta,\phi,\varphi,r,t)$

$F(u,v,w)$
= 3D Fourier transform
of $f(x,y,z)$

Surface
within
$F(u,v,w)$
at angles
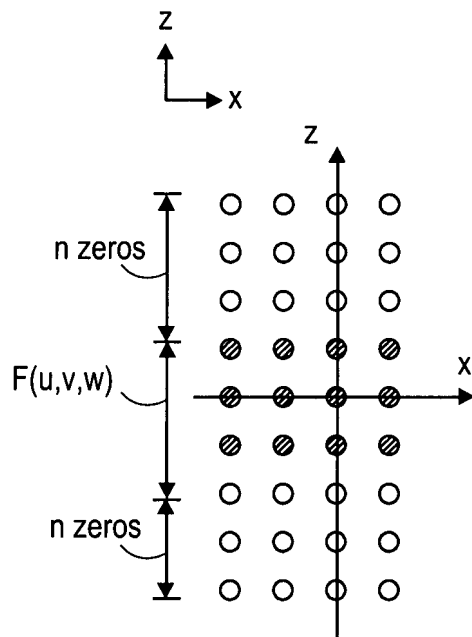(θ,ϕ,φ)

3D Fourier Slice Theorem

FIG. 3

Compute F(u,v,w)
(3D Fourier transform
of f(x,y,z),
f(x,y,z) having an
orientation $(\theta,\phi,\varphi,)$

110

Resample F(u,v,w)
along a surface
$S(\theta,\phi,\varphi,u',v')$

120

Compute inverse Fourier
transform
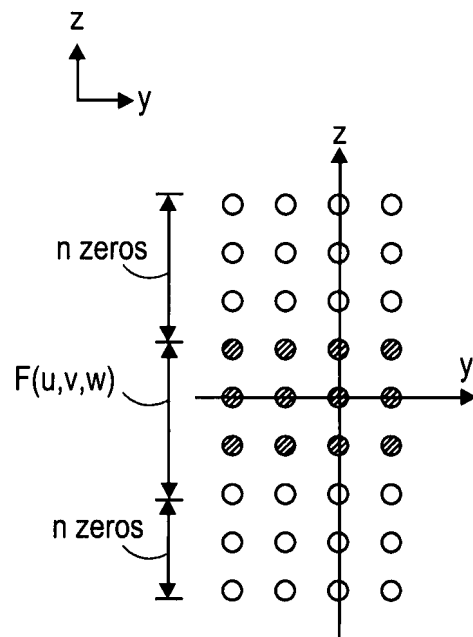$F^{-1}[S(\theta,\phi,\varphi,u',v')]$
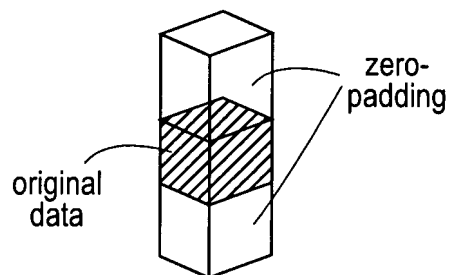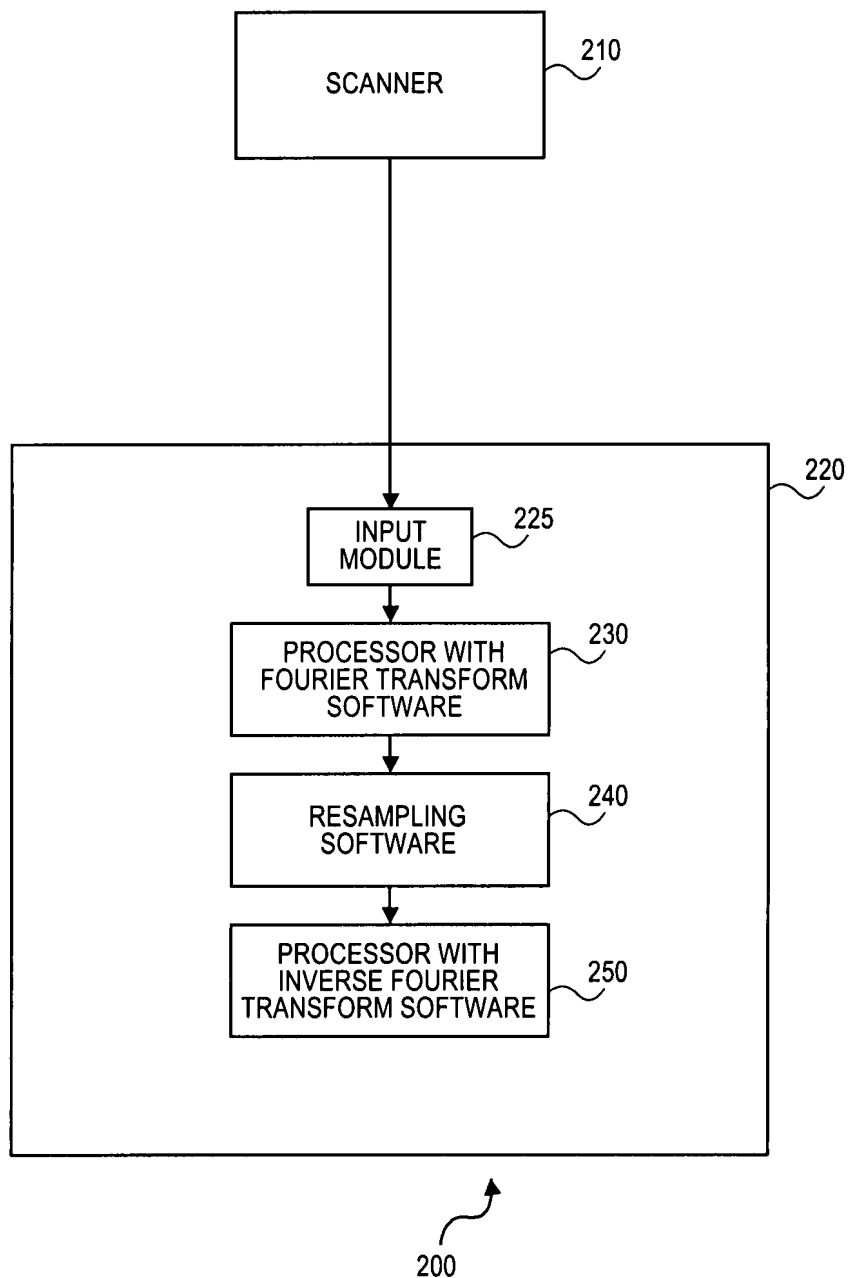of resampled surface

130
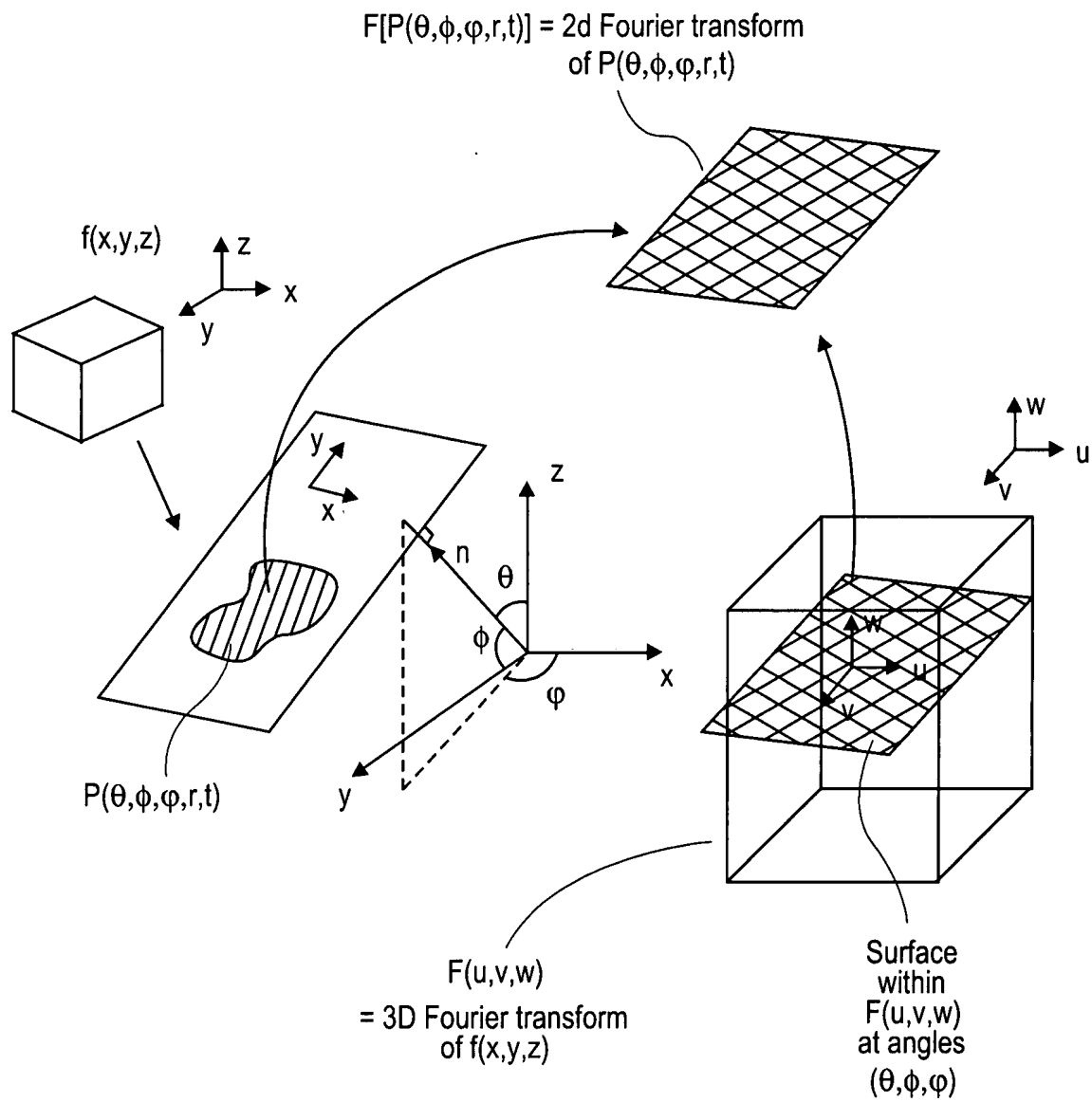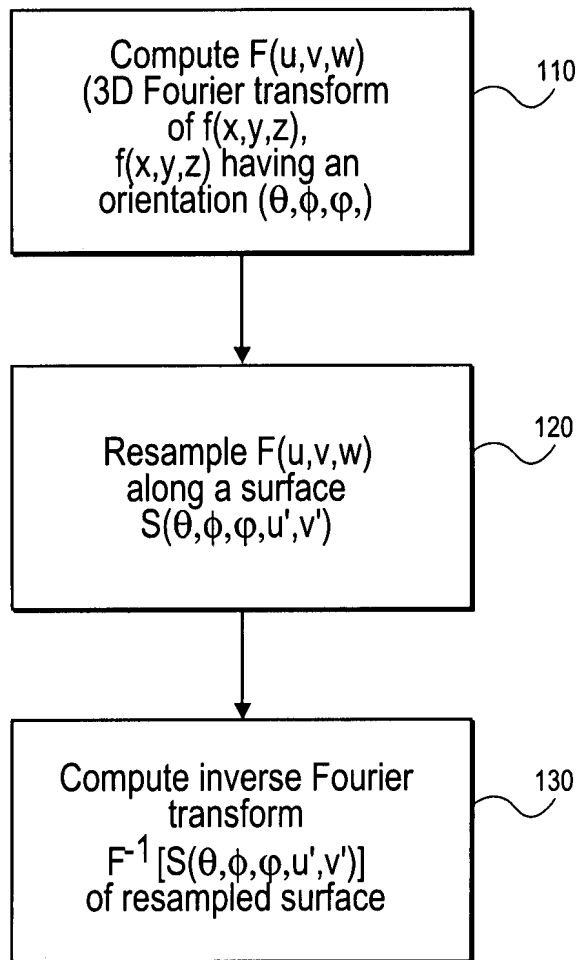
FIG. 4

FIG. 5A

FIG. 5B

FIG. 5C

FIG. 6

Table 1 Comparison of computational complexity of new method with existing methods

CT Volume (M=N=P)	Computational Complexity (Number of computations)						Computation advantage for new method (# of times faster)	
	Current Methods		New Method					
	For each DRR	For 100 DRRs	3-D FFT	For each DRR	For 100 DRRs		For each DRR	For 100 DRRs
32	262144	26214400	491520	18432	2334720		26.67	11.23
64	2097152	209715200	4718592	81920	12910592		57.60	16.24
128	16777216	1677721600	44040192	360448	80084992		122.18	20.95
256	134217728	13421772800	402653184	1572864	559939584		256.00	23.97
512	1073741824	1.07374E+11	3623878656	6815744	4305453056		531.69	24.94

FIG. 7